

## CLAIMS

1. A rocket plume detector through clouds comprising, an electro-optical sensor for detecting narrow band spectral emissions in a rocket engine plume through clouds, said sensor being mounted on an above-flying or orbiting platform.

2. The detector of claim 1 wherein said sensor isolates the rocket plume wavelength of interest selected from the group of aluminum, aluminum perchlorate, carbon dioxide, carbon monoxide, copper, copper hydride, hydrogen chloride, hydroxyl, methane, mon-methyl hydrazine, nitric acid, nitric oxide, nitrogen dioxide, nitrous oxide, polybutadiene, potassium, sodium, sulfur dioxide, and water to detect a rocket launch plume.

3. The plume detector of claim 1 wherein said platform is an aircraft or an orbiting satellite.

4. The detector of claim 3 which includes a narrow band filtered radiometer when carried on said aircraft or includes a spectrographic imager when carried on said satellite or vice versa.

5. The plume detector of claim 2 wherein said sensor can spectrally isolate or detect the emission wavelength of interest in the plume of a rocket being launched through fog, clouds and other water vapor.

6. The plume detector of claim 5 wherein said sensor can spectrally detect the emission wavelength of Na or K in a rocket engine plume.

7. The detector of claim 1 wherein said sensor has

- a) a narrow band filtered photometer,
- b) data acquisition electronics and
- c) a computer to monitor & record resulting data.

8. The plume detector of claim 1 comprising

- a) collection optics for plume emissions,

- b) a focal plane assembly which includes a spectral filter,
- c) data acquisition avionics,
- d) a global positioning system (GPS) receiver and
- e) a computer for receiving the detector data signal and the GPS data for data

acquisition, storage, processing and display.

<sup>9</sup>  
8. The plume detector of claim <sup>8</sup>7 wherein said focal plane assembly includes a photomultiplier and said spectral filter serves to pass the emission of interest and to reject the background emission.

<sup>10</sup>  
9. The photodetector of claim <sup>8</sup>7 wherein said GPS receiver records the flight path of the detector platform.

<sup>11</sup>  
10. The plume detector of claim <sup>8</sup>7 wherein a 10-nm-wide or spectral filter suitable for nighttime emission detection is replaced with a 0.005 nm atomic line filter (ALF) for daytime emission detection.

<sup>12</sup>  
11. The plume detector of claim 3 employing ultraviolet and visible imagers and spectrographic imagers as a UVISI sensor on-board said satellite platform, to measure from space, a ground-based Na emission source or to measure from space, the emission of interest in the plume of a rocket being launched.

<sup>13</sup>  
12. The plume detector of claim 3 employing a sensor with a narrow band spectral filter at a wavelength that is radiated through clouds.

<sup>14</sup>  
13. The plume detector of claim 3 adapted to employ a plurality of filters, radiometric or spectrometric, which detector is tunable to a desired rocket plume emission wavelength.

<sup>15</sup>  
14. The rocket plume detector of claim <sup>14</sup>13 being suited for both missile detection and characterization.